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Formatting and Delivering Arbitrary Content To Wireless Handheld Devices

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Field of the Invention

The invention generally relates to viewing content with a wireless handheld device, and more particularly to viewing and interacting with content interactive
10 content that is in a format incompatible with the handheld device, where an external system retrieves the incompatible content and converts it into compatible content.

Background

With the advent of fast and affordable networking equipment and Internet access,
15 many new products have come to market that allow a consumer to augment everyday experiences with content obtained over a network. For example, for some television broadcasts, such as home shopping channels and game shows, the broadcaster may provide web sites containing content relevant to a particular show, item, or topic currently being broadcast to viewers. For example, QVC Inc. broadcasts items for
20 display that may be purchased by a viewer having access to their Internet web site. Similarly, ABC's "Who Wants To Be A Millionaire" program simultaneously presents game show questions on an Internet web page so that viewers may play alongside contestants.

One attempt to provide web content along with a television broadcast is
25 Microsoft's "webtv" product, which incorporates an Internet browser within a television set top box. (Please note that all marks used herein are the property of their respective

owners.) Unfortunately, this integrated configuration, while convenient, presents several significant limitations. One limitation is that available screen real estate is limited if one combines display of television and interactive content. Alternatively, could elect whether to watch one or the other, but not both. Another limitation is that the content must be broadcast along with the viewing signal, e.g., over the cable television cable, which limits applicability of the product. Further, and more significantly, this solution requires usage of specialized hardware, e.g., inserters, encoders, decoders, processors, memory, etc., all of which significantly increases the cost of production for this solution.

A second attempt to provide contemporaneous interactive content is to simulcast interactive over the Internet. However, there are several significant problems with this solution. For example, this solution is not ergonomic, as it requires one to sit close to a personal computer display to receive the interactive content, and then look at a distance to the television. This is due to a computer typically being located remote to the television. Also, one's home computer typically is not even in the same room as the television, thus rendering this solution impractical as it requires one to leave the television viewing room to access the computer. Alternatively, one must install a computer system in the television viewing room, a solution many people would not like.

A third attempt at contemporaneous interactive content to provide, such as by way of an Internet simulcast, interactive content to wireless handheld computers, such as Microsoft Windows CE machines or Palm Computing's Personal Information Managers (PIMs) running AvantGo, Inc.'s AvantGo software, or equivalent. These machines operate using a microbrowser that receives the provided interactive content,

and the handheld reformats received content for display on the handheld. Reformatting is necessary since general interactive content assumes a general computer system recipient, and not the limited capabilities of a handheld device. Unfortunately, ability to reformat content significantly increases the cost and complexity of the handheld device,
5 as reformatting is nontrivial.

Brief Description Of The Drawings

The features and advantages of the present invention will become apparent from the following detailed description of the present invention in which:

10 FIG. 1 illustrates an exemplary hardware environment according to one embodiment of the invention.

FIG. 2 illustrates an exemplary flow chart for retrieving interactive content for a handheld device while watching a television broadcast.

15 FIG. 3 illustrates a suitable computing environment in which certain aspects of the invention may be implemented.

Detailed Description

FIG. 1 illustrates an exemplary hardware environment according to one embodiment of the invention.

20 A wireless handheld device **100** is in communication with a local computer system **102**, such as a home personal computer (PC). The handheld device communicates with the local computer system **102** over a wireless channel **104**, such as a radio frequency (RF), infrared (IR), or other wireless channel, using a

communication protocol such as (IEEE) 802.11 or other protocol. Various wireless transmission strategies may be used to convey data to the handheld device. For example, wireless communications may use direct or diffuse IR, narrowband RF transmissions, 900MHz or 2.4GHz transmissions, spread spectrum RF technology such as frequency hopping or direct sequence, etc. It is intended that any wireless communication channel and communication protocol may be used to implement wireless channel **104**.

The local computer system **102** acts as a computation engine to format incoming content, and it operates as a shared connection point to a network **106** and a storage device to cache additional content for the handheld device. In contrast with current handheld devices that are required to reformat interactive content to conform the content to the capabilities of the handheld device, in one embodiment, the power of the local computer system **102** is instead leveraged to perform this function. This allows the construction of the handheld device to be simplified, thus reducing manufacturing costs and risk of failure, e.g., less complex design leaves fewer elements to break. In the claims that follow, the phrases "formatting agent" and "formatting server" refer to a local computer system and/or an application program that converts content for use by the handheld device. A formatting agent/server may also act as a storage agent or cache for content, and as a network access point for multiple handheld devices.

In this embodiment, the handheld device is required only to support a single content format environment, e.g., a single environment or operating system for receiving user input and displaying output; in another embodiment, the handheld device supports a restricted number of content format environments. The local computer system **102** is

responsible for retrieving interactive content, which may be in any arbitrary format, such as Internet formats (e.g., HyperText Markup Language (HTML), Dynamic HTML (DHTML), Java, JavaScript, ActiveX), Standard formats (e.g., Extensible Markup Language (XML), Advanced Television Enhancement Forum (ATVEF), etc.), or a
5 proprietary format (e.g. Sports tickers, etc.), and then converting the arbitrary format as required into the handheld device's supported environment. In one embodiment, the handheld local data format is the Wireless Application Protocol (WAP) Wireless Markup Language (WML) (a variant on XML designed for portable devices).

It will be appreciated that some interactive content may be active or dynamic,
10 e.g., making use of Java, Javascript, etc. In such cases, the local computer system **102** executes the active or dynamic content and provides resultant data (e.g., output) to the handheld device. In effect, the local computer system acts as a simple input/output device, where the handheld controls the local computer system. User input to the
15 handheld is transmitted to the local computer system and used to control the active or dynamic content executing thereon, and results from such indirect user control of the local computer system is converted and sent back to the handheld device. In one embodiment, electronic mail (E-mail) services are provided to the handheld device.

The local computer system **102** is communicatively coupled to a network **106**, such as an intranet or Internet. In one embodiment, the local computer system retrieves
20 networked resources from remote content providers **108, 110, 112**. For example, such providers may offer games, news, shopping, etc., that are tied in or synchronized with television broadcasts, live sporting events, or other viewer experiences. It will be appreciated that any number of conventional wireless and wired techniques may be

used to connect the local computer system to the network **106**, and that various networks may be used to communicate with content providers. As discussed above, the handheld device receives data from the local computer system **102** over wireless channel **104**; however, note that the wireless channel may be carried, in part, over
5 network **106**. For example, a wireless base station (not illustrated) may be in communication with the local computer system **102** over the network **106**. Thus, communication from the local computer system is sent over the network **106**, to the base station, which in turn wirelessly communicates with the handheld device **100**.

The local computer system **102** is also communicatively coupled to a content
10 initiator **114**. Unlike the local computer system, the content initiator is likely physically remote from the local computer system and handheld device, and may also be communicatively coupled to the network **106**. When a user of the handheld desires to engage in entertainment augmentation services, the content initiator is responsible for providing the local computer system with a catalog of services currently available to the
15 user. The catalog of services corresponds to various interactive content that may be retrieved by the local computer system for conversion and provision to the handheld device. It will be appreciated that various known techniques can be used to ensure a local computer system is presented with a catalog that “makes sense” with respect to the location of the handheld device. For example, different geographic time zones are
20 frequently provided with different television broadcasts, thus it may be necessary to ensure that the catalog is specific to a particular handheld device’s location.

FIG. 2 illustrates an exemplary flow chart for retrieving interactive content for a handheld device while watching a television broadcast.

A first operation is to watch **200** an entertainment broadcast, e.g., a television broadcast, such as a traditional terrestrial, satellite or cable broadcast, or a broadcast through a physical medium such as an intranet or Internet network. It will be appreciated that the illustrated flowchart applies to using the handheld device in other contexts besides augmenting television viewing. During watching, a user of the handheld device selects **202** a button, such as a physical button **116** (FIG. 1) within the casing of the handheld device, or a logical button **118** drawn on the display **120** of the handheld device. This selection may occur irrespective of whether the user is watching television.

The illustrated embodiment assumes a television broadcast context, hence selection **202** of the button indicates the user wants to engage in entertainment augmentation, e.g., enhanced television making use of interactive content related to the watched **200** broadcast. In one embodiment, the handheld device and television are completely decoupled, e.g., the television broadcast and providing of interactive content are entirely separate. Thus, the television may be an ordinary television receiving a signal from any source, such as an aerial antenna. In this embodiment, interactive content is simply provided contemporaneous to the television broadcast. The degree of synchronization between interactive content and the broadcast may be determined at the broadcast head end. In another embodiment, the content is embedded within the television signal, and extracted for conversion and presentation to the handheld device.

In response to selecting the button **116, 118**, the handheld device, by way of the local computing device **102**, transparently connects **204** to a content initiator **114**. The content initiator may be operated by an entity that assembles various interactive content for delivery to requesting local computer systems **102**. In one embodiment, there are
5 multiple content initiators each providing different content arrangements to local computer systems for delivery to handheld devices. The handheld device requests **206** a catalog of available services from the content initiator . The content initiator is responsible for assembling data to store in the catalog. This data may be retrieved by the content initiator through contacting content providers **108, 110, 112**, and polling
10 them for data, or by having catalog data pushed to the content initiator.

In response to the request **206**, the handheld device receives **208** the catalog over the wireless link **104**. The catalog is displayed **210** on the handheld device display **120**, and a user selects **212** a desired content category, e.g., Sports broadcast, Electronic Program Guide (EPG), entertainment TV shows. In one embodiment, catalog
15 content categories comprise links to content provider **108, 110, 112** content (e.g., television guides, interactive entertainment, order processing systems, etc.), and selection **212** of a category directs the local computer system **102** to contact **214** the appropriate linked content provider.

In response to contacting a linked content provider **108, 110, 112**, the local
20 computer system receives **216** content "feed" from the linked content provider in a first data format, e.g., HTML, DHTML, XML, Java code, etc. In one embodiment, the local computer system tests **218** whether this first data format is compatible with the

handheld device, e.g., can the content be directly forwarded to the handheld device for appropriate processing.

If the first data format is incompatible with the handheld device, the processing power of the local computer system **102** is utilized to convert **220** the first data format into a second data format that is compatible with the handheld device, e.g., the local computer system acts as a formatting agent for the handheld device. For example, in one embodiment, the handheld device is configured to process WML encoded data. When the first data format is non-WML interactive content, the local computer system converts it into the compatible second data format WML content.

In another embodiment, conversion is based on handheld device characteristics. Thus, if the handheld device has limited memory, content images may be deleted, reduced in size, replaced with placeholders, or streamed to the handheld for scrolling across the screen as necessary. (For scrolling an image past the display, no storage is required beyond display needs since the image is not stored on the handheld device.) If the handheld device has a non-color display, color data may be removed from content. If the content includes forms or other web page data, these forms and other data can be converted and re-formatted, if necessary, to best-fit the handheld device display.

In another embodiment, the storage capacity of the local computer system **102** is used to cache content received from the network. This cached data may be displayed on the handheld device. An exemplary use for cached data is caching a weekly download of an Electronic Program Guide (EPG). The EPG is likely to be accessed frequently, and caching the guide allows it to be displayed quickly, and also allows it to be displayed without use of a network connection.

Once the first data format is converted **220** into the second data format, it is sent **222** to the handheld device for processing. If **218** the content was originally compatible, as may be found, for example, at select sites directly supporting the handheld device, then the original content is sent **224** to the handheld device for processing.

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FIG. 3 and the following discussion are intended to provide a brief, general description of a suitable computing environment in which certain aspects of the illustrated invention may be implemented.

10 An exemplary system for implementing the invention includes a computing device **300** having system bus **302** for coupling various computing device components. This system, or portions thereof, may be used to implement the FIG. 1 handheld device **100**, local computer system **102**, content providers **108-112**, and content initiator **114**. Typically, attached to the bus are non-programmable and programmable processors **304**, a memory **306** (e.g., RAM, ROM), storage devices **308**, a video interface **310**, and
15 input/output interface ports **312**. Storage devices include hard-drives, floppy-disks, optical storage, magnetic cassettes, tapes, flash memory cards, memory sticks, digital video disks, and the like.

Portions of the invention may be described by reference to different high-level program modules and/or low-level hardware contexts. Those skilled in the art will
20 realize that program modules can be interchanged with low-level hardware instructions. Program modules include procedures, functions, programs, components, data structures, and the like, for performing particular tasks or implementing particular abstract data types. Modules may be incorporated into single and multi-processor

computing devices, such as the local computer system, content providers, content initiators, handheld devices such as the device illustrated in FIG. 1, Personal Digital Assistants (PDAs), cellular telephones, and the like. Thus, the storage systems and associated media can store data and executable instructions for the computing device.

- 5 Modules may be implemented within a single computing device, or processed in a distributed network environment, and stored in both local and/or remote memory.

The computing device is expected to operate in a networked environment using logical connections to one or more remote computing devices **314, 316** through a wired or wireless network interface **318**, modem **320**, or other communication pathway.

- 10 Computing devices may be interconnected by way of a network **322** such as an intranet, the Internet, or other network. This network may be, in whole or in part, the FIG. 1 network **106**. Thus, for example, with respect to the illustrated embodiments, assuming computing device **300** is the handheld device **100**, then by way of the local computer system **102**, remote devices **314, 316** may respectively be the content initiator **114** and
15 a content provider **108, 110, 112**. The FIG. 1 handheld device **100**, by way of the local computer system **102**, may receive content catalogs and content provider **108-112** content distributed over the network **322**.

- It will be appreciated that remote computing devices **314, 316** may be configured like computing device **300**, and therefore include many or all of the elements discussed
20 for computing device. It should also be appreciated that computing devices may be embodied within a single device, or separate communicatively-coupled components, and may include or be embodied within routers, bridges, peer devices, web servers, and

application programs utilizing network application protocols such as the HyperText Transfer Protocol (HTTP), File Transfer Protocol (FTP), and the like.

Having described and illustrated the principles of the invention with reference to
5 illustrated embodiments, it will be recognized that the illustrated embodiments can be modified in arrangement and detail without departing from such principles.

And, even though the foregoing discussion has focused on particular
embodiments, it is understood that other configurations are contemplated. In particular,
even though expressions such as “in one embodiment,” “in another embodiment,” or the
10 like are used herein, these phrases are meant to generally reference embodiment possibilities, and are not intended to limit the invention to particular embodiment configurations. As used herein, these terms may reference the same or different
embodiments, and unless implicitly or expressly indicated otherwise, embodiments are
combinable into other embodiments. Consequently, in view of the wide variety of
15 permutations to the above-described embodiments, the detailed description is intended to be illustrative only, and should not be taken as limiting the scope of the invention.

What is claimed as the invention, therefore, is all such modifications as may
come within the scope and spirit of the following claims and equivalents thereto.